



## A RIVER'S PAST, PRESENT, AND FUTURE

**GRADES:** 6-A\*

**SUBJECT:** Economics, Geography, History, Science, Social Studies

**SKILLS:** Analyzing, communicating, comparing, describing, evaluating, inferring, listing, observing, reading, researching, small group work, writing

**DURATION:** Several class periods, depending on age of students

**SETTING:** Indoors

**KERA ACADEMIC EXPECTATIONS:** 1.1, 1.2, 1.3, 1.4, 1.11, 2.3, 2.18, 2.19, 2.20, 4.2, 5.3, 6.1, 6.2, 6.3

### OBJECTIVE:

To gain an understanding of the importance of a local waterway.

### METHOD:

Select a local river and research to learn about its geography, cultural history, pollution problems, and importance to the community.

### MATERIALS NEEDED:

- Topographic or road maps
- Drawing paper
- Pencils
- Resource materials such as local newspapers, books and articles about local history, information from conservation and wildlife officials, etc.
- Worksheet - River Research Topics

### PROCEDURE:

- Divide class into five groups; assign each group a topic for research: geography, wildlife habitat, economics, history, pollution.
- Give each group the materials needed and the section of Worksheet - River Research Topics that pertains to that group.
- Each group will use the resource materials to answer the questions on the worksheet and find any other pertinent information.
- Make a map of the river and the river basin; plot pertinent information on it.

### EVALUATION:

- Each group shares the information found with rest of group.
- What is the relationship between pollution and economics? Geography? Habitats? History?

### EXTENSIONS:

- Contact another class in a school upstream or downstream; encourage them to conduct the investigations and compare results.
- Conduct a RIVER DAY to share the information with the rest of school, etc.

\* For Grades K-5, the topics can be researched by the whole class.

(adapted from National Audubon Society, 1995)

## **WORKSHEET - RIVER RESEARCH TOPICS**

### **ECONOMICS:**

- How is the river used?
- How does it benefit the surrounding area?
- Place any dam sites, power plants, locks, bridges, major cities, etc., on the map.

### **GEOGRAPHY:**

- Where is the head or origin of the river?
- Where is the mouth?
- What waterbody does it empty into?
- Are there any nearby wetlands?
- Plot the preceding points on the map.

### **HABITAT:**

- How does the river benefit wildlife? (Spawning fish, migrating or nesting birds, etc.)
- What aquatic species live in the river?
- Do any endangered species live in or near the river?

### **HISTORY:**

- What is the river's role in history?
- Has any major exploration occurred along its course?
- When was it first discovered?

### **POLLUTION:**

- How have people changed the river?
- Is it threatened by pollution?
- List the types of pollution found in it and what the source is.
- Are there any organizations working to clean up the river?
- What is being done?
- Plot the sources of pollution on the map.

(adapted from National Audubon Society, 1995)



## IDEAS FOR ALL AGES

### DATES TO REMEMBER:

- April 22 - Earth Day
- May - American Wetlands Month, Kentucky Water Awareness Month
- June - American Rivers Month

### RECYCLING

- Promote or organize a recycling project for community or school.
- Encourage local businesses to reduce waste by recycling.
- Create a booklet about what can be recycled in your community and where to take it.
- Identify drop-off centers for used oil recycling. A copy of a community oil program guide is available from the Kentucky Division of Waste Management.

(The Junior League of Greenwich, 1995; Kentucky Department for Environmental Protection, 1993)

### RESTORATION PROJECTS

- Install streambank stabilization structures.
- Restore stream side habitats.
- Landscape with Kentucky native plants.

(Thompson and Green, 1994)

### WATER QUALITY

- Prepare an audio-visual program to illustrate and explain nonpoint source pollution.
- Conduct surveys in school or neighborhood about water quality issues.
- Help to solve a local water quality problem.
- Prepare and present lessons about nonpoint source pollution and water quality to younger students.
- Make a water quality bulletin board with pictures of polluted and clean water.
- Hold a sing-a-long with songs about water.
- Hold a contest for best poster, song, skit, poem, or slogan about water quality.
- Make and distribute a booklet about nonpoint source pollution with suggestions for prevention.
- Write a play about water quality.
- Make bookmarks about clean water.
- Hold a water quality festival featuring artwork, displays, water quality groups, games, entertainment, etc.
- Sponsor runs, walks, bike rides, marches for clean water.
- Hold library programs for children and adults on water quality and nonpoint source pollution.
- Develop a water reading list.
- Make a water flag and award it to groups and schools which develop or participate in clean water programs.
- Sponsor teacher training's for water quality programs.
- Sponsor the purchase of water quality test equipment for schools and other classroom materials.
- Develop a water quality logo for T-shirts, mugs, etc.

- Host community discussions and forums on water quality issues.
- Create awards for individuals and organizations involved in water quality programs.
- Write editorials on nonpoint source pollution.
- Give a "Good Housekeeping" award to businesses and industries dedicated to water quality protection.

(Keep America Beautiful, 1989; Kentucky Earth Day 1990 Management Team, 1990)

## **WETLANDS**

- Take a walk in the wetlands.
- Read books and stories about wetlands.
- Organize or join a local group to protect wetlands in the community.
- Plan a "Walk in the Wetlands Day" for local community.
- Talk to local government about wetlands protection in your community.
- Publicize American Wetlands Month and run stories in local newspapers and TV stations about wetlands and the need for wetlands protection.
- Identify wetlands in local community; find out who owns them and what is being done for their protection.
- Create displays concerning wetlands protection.
- Join a local group that is working to protect wetlands.

(Terrene Institute)

## OTHER RESOURCES

### GRADES:

- K - 5** The Watercourse and Council for Environmental Education, 1995, Stream Sense: Project WET, pp. 191-195.  
Use your senses to observe a stream.
- K - A** Environmental Concern and The Watercourse, 1995, Helping Wetland Habitats: Wow! The Wonder of Wetlands, pp. 288-302.  
Identify, design, and participate in needed projects to improve wetlands.
- 4 - A** Western Regional Environmental Education Council, 1987, Water Canaries: AQUATIC Project WILD, pp. 35-39.  
Stream walk sampling techniques.
- 5 - 8** The Watercourse and Council for Environmental Education, 1995, Water Celebration: Project WET, pp. 446-449.  
Plan a water celebration.
- 6 - A** Maryland Forest, Park and Wildlife Service; Anne Arundel County Public Schools, 1988, Forest Buffer Investigation: Out Door Education Program Guide Series, Publication No. 2295/30 (New 1/88) 13pp.  
Determine the difference between an adequate and inadequate buffer and its effects on water quality.  
The Watercourse and Council for Environmental Education, 1995, Water Actions: Project WET, pp. 12-18.  
How to investigate, analyze, and participate in projects that address water resource issues.
- 7 - A** Lieblich, Suzanne, ed., 1995, Project Part 3 - Survey of a Local Waterway: National Science Teachers Association/DuPont, Understanding Our Environment Series, Water, pp. 32-43.  
Stream walk sampling techniques.  
Western Regional Environmental Education Council, 1987, Living Research - Aquatic Heroes and Heroines: AQUATIC Project WILD, pp. 149-152.  
Identify and interview individuals in community who contribute to water quality protection, write their biography.
- 9 - A** Cole, Charles Andrew, 1996, Wetlands Restoration: Pennsylvania State University, Managing Your Restored Wetland, chpt. 3, pp. 14-21.  
Daniels, Kate and Paul, 1992, Raritan Watch, Water Quality Monitoring Program: Raritan River Educational Consortium, Cook College, New Brunswick, New Jersey, 69pp.  
Folitt, Ruth, 1989, Bay Repair Kit: Sarasota Bay National Estuary Program, 16p.  
How to keep bay areas (or other water resources) clean by reducing nonpoint source pollution.  
Kentucky Division of Waste Management, 1994, How to Organize a Volunteer Cleanup Event: 48p.  
Kentucky Division of Water, Hints for Trash Pick-ups on Your Neighborhood Stream: Kentucky Department for Environmental Protection, Water Watch Advisory Collection, 18pp.  
Excerpts from clean-up planning documents.

- Mills, Michael, et. al., 1993, Methods for Assessing Biological Integrity of Surface Waters: Kentucky Division of Water, 139 pp.
- New Jersey Department of Environmental Protection, 1987, The Clean Water Book: Division of Water Resources, 24pp.  
A guide to reducing water pollution in the home and neighborhood.
- Nonpoint Source Program Team, 1996, Watershed Owner's Streamwalk Guide: Texas Natural Resource Conservation Commission, GI-218.  
Mapping the watershed.

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## **APPENDIX A**

### **BEST MANAGEMENT PRACTICES FOR REDUCING NONPOINT SOURCE POLLUTION**

Nonpoint source pollution can be reduced by limiting surface runoff and keeping runoff clean.

#### **HOMEOWNERS, LANDSCAPERS, GARDENERS:**

- Use homemade biodegradable alternatives to household chemicals.
- Dispose of hazardous household chemicals and waste in a licensed hazardous waste landfill.
- Use alternate treatments for household sewage if sewers are not available and septic systems not appropriate.
- Use mulch in gardens to prevent siltation.
- Do not dump anything down storm drains or sinkholes.
- Recycle used motor oil.
- Fix automotive leaks.
- Use biodegradable detergents for washing cars.
- Use sand and ash as road deicers.
- Read labels and use correct amounts of fertilizer and pesticides or use organic fertilizers and biological pest controls.
- Keep fertilizer and pesticides on the lawn and not on sidewalk, driveways, gutters.
- Landscape with native plants to reduce the need for watering.
- Compost yard waste: grass clippings, leaves, etc.
- Maintain septic tanks properly.
- Clean up pet wastes.
- Reduce soil erosion by planting grass or ground cover.
- Install permeable pavements to increase absorption and reduce runoff.
- Participate in local "Adopt-A-Stream Program."

#### **FARMERS:**

- Read labels and use correct amounts of fertilizer and pesticides; clean up spills promptly and dispose of used containers properly.
- Use soil conservation practices such as no till and strip cropping.
- Plant a cover crop to prevent soil erosion.
- Leave buffer zones between crop fields and sinkholes, and waterways.
- Construct collection and treatment ponds, stack pads, etc. for livestock waste management.
- Fence livestock away from waterways.
- Dispose of dead animals and other hazardous waste properly, not in sinkholes.
- Seal abandoned wells.
- Have a water quality protection plan.

### **DEVELOPERS AND CONSTRUCTION CONTRACTORS:**

- Before clearing a site, develop and implement a sediment control plan.
- Design drainage systems to maximize infiltration and reduce concentrated runoff.
- Maintain natural drainage as much as possible, especially wetlands, minimizing the disturbance to trees and vegetation.
- Work with existing topography to minimize grading.
- Leave ground cover or plant temporary vegetation to minimize soil erosion.
- Use temporary dikes, catch basins, hay bales, or sedimentation fencing to slow and catch runoff.
- Dispose of construction waste: lumber, bricks, paints, solvents, etc., at approved sites.

### **LOGGERS AND FORESTERS:**

- Avoid wet and unstable areas, work in the dry season if possible.
- Construct roads across the slope of the land.
- Treat contaminated water before it reaches local waterways..
- Construct temporary drainage systems.
- Read labels and use correct amounts of fertilizer and pesticides; dispose of used containers properly.
- Keep stream crossings to a minimum.
- Plant a ground cover if the area is going to be exposed for a long time.
- Use low-impact logging and reforestation methods.
- Use equipment no larger than necessary.
- Leave buffer zones between logged areas and wetlands, sinkholes, and waterways.

### **MINING COMPANIES:**

- Monitor water entering and leaving mine sites.
- Treat contaminated water before it reaches local waterways.
- Construct sediment catch basins.
- Stabilize mine waste areas.
- Leave buffer zones between mining areas and wetlands, sinkholes, and waterways.
- Remove and store top soil in a protected area.
- Used stored top soil to backfill and grade mined area.
- Grade to gentle slopes to reduce velocity of runoff.
- Reseed reclaimed areas with native plants.

### **INDUSTRY:**

- Use a source of energy other than fossil fuels if possible.
- Install scrubbers on factory exhausts and smoke stacks.
- Recycle waste or dispose of waste properly.



**CIVIC GROUPS:**

- Identify potential causes of nonpoint source pollution in community.
- Sponsor hazardous waste collection days, river sweeps, "Adopt-A-Stream or Road Programs."
- Collaborate with other civic, environmental, business, and government groups to encourage the use of water quality protection practices.

**LOCAL GOVERNMENT LEADERS:**

- Establish ordinances for :
  - hazardous waste disposal
  - construction erosion/sediment control
  - trash pickup
  - wetlands protection
- Establish community-wide development plan.
- Create a watershed enhancement board.

(adapted from Terrene Institute, 1991; The Watercourse and Council for Environmental Education, 1995; Barnhisel, and Hower, 1996; Mississippi Department of Environmental Quality, 1993; GWEB)

## SAFE ALTERNATIVES TO HOUSEHOLD CHEMICALS

HOUSEHOLD PRODUCT	LESS TOXIC ALTERNATIVE
Abrasive cleaners and powders	rub with half a lemon dipped in Borax OR baking soda and mild detergent
Air fresheners	simmer spices or citrus fruits OR use potpourri or flowers OR 1 tsp. vanilla or other flavor on cotton balls OR set out open box of baking soda
Ammonia - based cleaners	undiluted white vinegar OR salt and water mixture OR baking soda and water mixture
Bleach (laundry)	1/2 cup vinegar, baking soda, or Borax per load OR use powdered bleach
Brass and copper cleaner	make paste with 2 tsp. salt, 1 T. flour and vinegar, rub on, let dry, rinse and polish OR rub with toothpaste
Disinfectants	1/2 cup Borax in 1 gal. boiling water OR undiluted white vinegar
Drain cleaners	flush weekly with 1/4 cup baking soda in boiling water or 2 oz. vinegar
Flea collars and sprays	eucalyptus or rosemary herbal collar or ointment OR Brewer's yeast in diet
Floor and furniture polish	1 part lemon oil and 2 parts linseed oil toothpaste to remove water stains
Garden pests	import ladybugs and praying mantis
Household batteries	solar - powered batteries OR windup watches and clocks OR rechargeables OR AC adapters
House plant insecticide	Spray leaves with solution of bar soap and water or old dish water, rinse off
Insects	1 part Borax and 1 part brown sugar set out OR cream of tartar sprinkled in path OR red chili pepper
Moth balls	cedar chips OR lavender flowers with clothes
Oven cleaner	wipe while still warm sprinkle with water and liquid dish washing soap and baking soda, then more water and leave overnight
Paint and varnish remover	sandpaper, scraper, and heat gun
Pool chemicals pH	disinfect with ozone or UV light system baking soda
Rug and upholstery	clean with soda water paste OR sprinkle with dry cornstarch, then vacuum
Silver polish	1 T. salt, 1 T. baking soda, few sheets of aluminum foil in boiling water, immerse silver and let sit for an hour, rinse and polish
Spot remover	Club soda OR immediate cold water OR cornmeal and water soak OR lemon juice
Toilet cleaner	brush with baking soda OR soak with Borax or white vinegar
Window cleaner	8 parts water and 1 part vinegar and rub with newspapers

(Kentucky Cooperative Extension Service; Kentucky Division of Waste Management, 1996; Kentucky Natural Resources and Environmental Protection Cabinet; Wisconsin Department of Natural Resources, 1989)

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## APPENDIX B

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## APPENDIX C

### ACTIVITIES BY GRADE

▼ activity suitable for these grades

\* activity adapted for these grades

□ activity suitable for use in outdoor classroom

P.	ACTIVITY	K	1	2	3	4	5	6	7	8	9	10	11	12	A	□
2	Water, Water, Everywhere ...	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
3	Recycled					▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
7	Acting the Water Cycle			▼	▼	▼	▼									
8	What Comes Around...	*	*	*	*	▼	▼	▼	▼	▼						
9	Watch Water Cycle	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
10	Transpiration in Plants							▼	▼	▼	▼	▼	▼	▼	▼	
11	A Condensed Demonstration			▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	□
15	Where in the World are We?	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
16	The Earth's Sponge	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	□
20	Locating Wetlands	*	*	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	
24	Porosity and Permeability	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
26	How Fast Do Soils Take in Water?	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	□
30	Groundwater	▼	▼	▼	▼	▼	▼	▼	▼	▼						
31	Aquifers	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
32	Groundwater Model					▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
33	Soda Sink	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
37	Nonpoint Source Pollution Tour	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
41	Pollution Monitoring	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
42	The Gentle Rain	*	*	*	*	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

P.	ACTIVITY	K	1	2	3	4	5	6	7	8	9	10	11	12	A	
47	How Many Fish Can Live ....				▼	▼	▼	▼	▼	▼						
52	Make Splash Boards ...	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	☐
53	How Do Crop Cover, etc., ...	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
54	Erosion Control Demonstration ....	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	☐
58	Jill and Fred's Excellent Adven.	✱	✱	✱	✱	▼	▼	▼	▼	▼	✱	✱	✱	✱	✱	
62	Secret Sink							▼	▼	▼	▼	▼	▼	▼	▼	
66	To Develop or Not to Develop?							▼	▼	▼	▼	▼	▼	▼	▼	
70	Adopt a Stream - Stream Walk	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
84	Dig in and Root for a Rich Envir.	✱	✱	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	☐
86	Community Cleanup	✱	✱	✱	✱	✱	✱	✱	✱	✱	▼	▼	▼	▼	▼	
89	Storm Drain Stenciling Project	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
91	Creating Buffer Zones	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	☐
96	A River's Past, Present and Future	✱	✱	✱	✱	✱	✱	▼	▼	▼	▼	▼	▼	▼	▼	
98	Ideas for All Ages	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

## APPENDIX D

### GLOSSARY

**Acid** - a substance that has a pH less than 7, more hydrogen ions than hydroxide ions, and releases hydrogen ions in solution.

**Acid mine drainage** - the oxidation of pyrite, a mineral associated with coal seams, producing sulfuric acid which is released into nearby waterways.

**Acid precipitation (rain)** - any type of precipitation that has a pH of 5.0 or less.

**Aquatic** - any plant or animal that lives in water.

**Aquifer** - water bearing soil or rock.

**Atmosphere** - the layer of air surrounding the earth.

**Base** - a substance with a pH more than 7, that has less hydrogen ions than hydroxide ions, and releases hydroxide ions in solution.

**Best management practices** - methods that reduce the nonpoint source pollution that occurs from various land uses.

**Buffer zone** - an area of trees, grass, or shrubs designed to capture and filter surface runoff before the runoff reaches a waterway.

**Carbonate** - a rock or mineral containing mostly calcium carbonate.

**Cave** - a natural cavity beneath the earth's surface.

**Channelization** - the straightening or other modification of an existing river channel.

**Condensation** - the process in which a gas changes to a liquid.

**Compost** - a mixture that consists largely of decayed organic matter used for fertilizer.

**Conservation** - the use, management, and protection of resources so that they are not degraded, depleted, or wasted and are available on a sustainable basis for use by present and future generations.

**Contaminant** - any substance that pollutes the water.

**Degraded** - pertaining to an environment that has been altered in any way that renders it less suited for its intended use.

**Development** - the conversion of natural environments to human built environments such as farms and urban areas.

**Discharge** - the outflow of water from a stream or aquifer.

**Dissolved oxygen** - oxygen gas that is dissolved in water.

**Dredge** - to clean, deepen, or widen a water body with a mechanical scoop.

**Ecosystem** - an ecological community together with its environment, functioning as a unit.

**Environment** - all the external factors, conditions, and influences that affect an organism of a biological

community.

**Erosion** - the process of wearing away the land surface by the action of wind, water, or ice.

**Evaporation** - the process in which a liquid changes to a gas, usually upon exposure to air and/or heat.

**Evapotranspiration** - the combined amount of water vapor from surface evaporation and plant transpiration.

**Fertilizer** - a nutrient-rich substance used to promote plant growth.

**Floodplain** - the portion of the river valley that is adjacent to the river channel and is covered with water when the river floods its banks.

**Fresh water** - water with little or no salt content.

**Fungicide** - a pesticide that controls the growth of fungus.

**Grading** - shaping the land surface by leveling and smoothing.

**Groundwater** - water found in the saturated zone of the soil, porous rocks, and cracks and crevices in rocks.

**Hazardous waste** - waste that is harmful when ingested, inhaled, or comes in contact with bare skin.

**Herbicide** - a pesticide that is used to control unwanted plants, a weed killer.



**Hydrologic cycle** - the route that water circulates throughout the earth, including condensation, precipitation, runoff, evaporation, infiltration, and transpiration.

**Hydrology** - the study of the movement and interaction of water on the land surface, under the ground, and in the atmosphere.

**Infiltration** - the process by which water seeps into the ground.

**Indicator species** - a species whose condition, presence, or absence gives early warnings that an ecosystem is being degraded.

**Insecticide** - a pesticide used to control insect pests.

**Karst** - a landscape underlain by limestone or other carbonate rock, and characterized by sinkholes, caves, sinking streams, springs, and a lack of surface streams.

**Limestone** - carbonate rock.

**Macroinvertebrate** - animals without a backbone that are large enough to see without magnification.

**Nitrate** - a salt of nitric acid, a common water pollutant.

**Nonpoint source pollution** - water pollution that does not originate from one specific location.

**Nutrient** - an element or compound that is needed for the survival, growth, and reproduction of a plant or animal.

**Optical brighteners** - fluorescent dyes used in laundry detergents to make clothes look brighter.

**Oxidation** - chemical weathering caused by the combining of elements with oxygen.

**Pathogen** - a disease producing agent.

**Percolate** - downward movement of water through soil and rock to the groundwater.

**Permeability** - the ability of a porous substance (rock, soil, etc.) to allow water to flow through it freely due to connected pore spaces.

**Pesticide** - chemicals used to kill plants and animals that are considered to be pests.

**pH** - a measurement indicating the acidity or alkalinity of a substance, ranging from 0 (most acid) to 14 (most alkaline), 7 is neutral.

**Point source pollution** - pollution that can be traced to a definite source, such as a straight pipe.

**Pollution** - any substance, biological or chemical, that contaminates or reduces the quality of an environment and is detrimental to living organisms when it occurs in excess.

**Porosity** - the amount of space between the particles of a soil or rock.

**Precipitation** - any type of water falling from the atmosphere (rain, snow, hail).

**Recycle** - to collect and reprocess resources so that they can be used again.

**Reforestation** - reestablishing forest growth in a logged area.

**Riffle** - a small rapids area in a stream.

**River basin** - the land areas from which a river gathers its water.

**Resource** - anything obtained from the environment to meet human needs and wants.

**Restoration** - the process of bringing back to existence, or reestablishing, the original condition of a degraded environment.

**Rodenticide** - a pesticide that is used to control rodents such as mice and rats.

**Runoff** - water that drains from or flows off the land.

**Sandstone** - a rock composed of sand grains.

**Saturated zone** - the area underground where water completely fills the pore spaces in rocks and soil.

**Sediment** - uncemented sand, silt, gravel, clay, silt, etc.

**Sedimentation** - a process in which heavy particles settle out of water.

**Septic system** - a system that disposes of household sewage through a leach field and into the groundwater.

**Sewage** - human organic waste material carried in suspension in water.

**Siltation** - the process of becoming filled with silt.

**Silviculture** - the care and cultivation of forest trees.

**Sinkhole** - a depression seen on the earth's surface in a karst area, formed by the collapse and enlargement of a solution channel, through which surface water drains directly to the groundwater.

**Sheet erosion** - widespread surface erosion caused by surface runoff.

**Soil** - the top layer of the earth's surface that consists of uncemented rock and mineral fragments and organic material.

**Solution features** - channels, sinkholes, caves, etc., caused by acidic water dissolving carbonate rock.

**Splash erosion** - occurs when soil particles are dislodged by falling raindrops during a heavy rainfall and are then swept away by surface runoff.

**Straight pipe** - an illegal pipe that drains household sewage directly to nearby waterways or sinkholes.

**Strip cropping** - alternating a different crop in an adjacent strip of land.

**Storm drain** - an opening at street level that funnels surface runoff to the storm sewers.

**Storm sewer system** - an underground drainage system that transports surface runoff to sewage treatment plants, or most often to nearby waterways or sinkholes.

**Strip mine** - a surface mine that strips the covering soil and rock from the ore.

**Surface runoff** - water flowing on the earth's surface.

**Sustainable** - continuing for the foreseeable future.

**Topographic map** - a map which marks the variations in elevation across a given landscape.

**Toxic chemicals** - chemicals that are harmful if ingested, inhaled, or come in contact with bare skin.

**Transpiration** - the process by which water absorbed through plant roots evaporates from the leaves.

**Tributary** - a smaller river or stream that flows into a larger river or stream.

**Unsaturated zone** - the area underground where water and air fill the pore spaces.

**Use** - the application or employment of something for some purpose.

**Water cycle** - see hydrologic cycle.

**Watershed** - the land area from which surface runoff drains into a body of water.

**Water table** - the boundary between the saturated and unsaturated zones in soil.

**Waterway** - a stream, river, or canal that is used for travel or transport.

**Wetland** - any land that tends to be wet or flooded most of the year.

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